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EXCELLENCE IN ELECTROMECHANICS

Fuzes are as old as gunpowder and as modern as computer chips and very-high-speed integrated circuits.

Yet, since the early years of weapon fuzing, the function of the fuze has remained the same—to safely detonate the weapon at the point of maximum target lethality.

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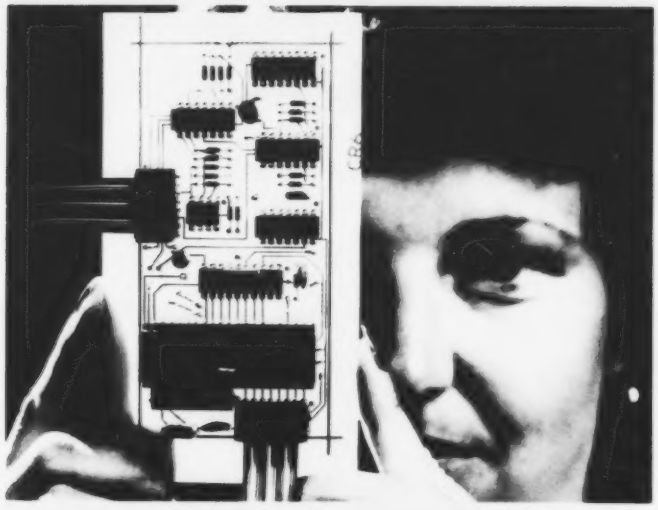
PRODUCT AREAS

Any military pilot will tell you that a bad fuze is your enemy's best friend.

We don't want pilots (or ordnance handlers) to worry. That's why fuzes and related devices from the Naval Weapons Center (NWC) are designed and developed by highly trained personnel using the best equipment and facilities.

The Electromechanical Division of NWC's Fuze and Sensors Department has designed and developed many of the fuzes, safety-arming devices, arming-firing devices, and explosive components now being used in the Fleet's air-launched weapons.

Theoretical analysis, engineering experimentation, and laboratory testing ensure that every item developed by the Electromechanical Division is well-designed, safe, and reliable.



WHAT ARE THESE ITEMS AND WHAT DO THEY DO?

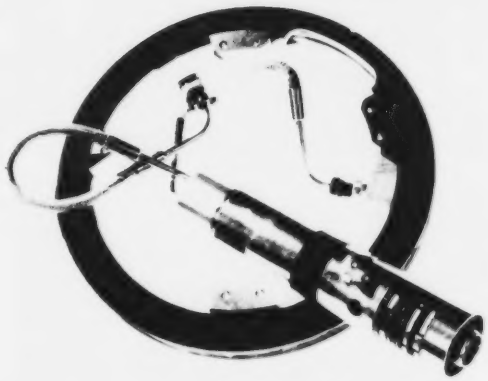
Electromechanical fuze systems in guided missiles and free-fall weapons keep warheads safe to handle, store, and carry until the target is identified and the weapons are properly launched. The fuze system then arms itself and initiates the warhead at the desired weapon-target encounter point.

When weapons are launched, **safety-arming devices** use environmental energy (like acceleration forces or air pressure) for the arming function. The explosive trains and the electrical circuits are kept physically disconnected or "switched off" until the weapons are safely away from the launch point. At the end of the safe-separation distance, the weapons are armed by functions of the safety-arming devices and are ready for target encounter.

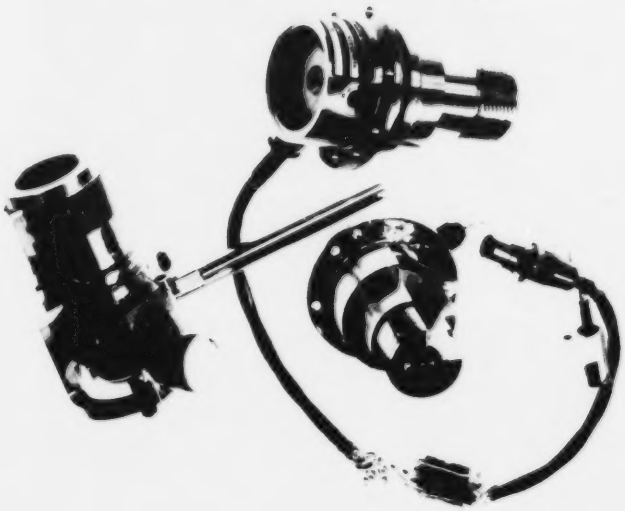
When the weapons encounter the target, **proximity fuze triggering devices** sense that the weapons are in the vicinity of the target or, in the case of a direct or glancing impact, **contact fuze triggering devices** sense that impact has occurred. In either case, the warheads are initiated at the optimum point of encounter.

Like our warhead safety-arming devices, NWC-developed **rocket motor arming-firing devices** keep the weapons' motor igniters electrically and mechanically "safe" until the weapons are intentionally fired. Rocket motor arming-firing devices are used for surface- and air-launched firings and for remotely armed static-test firings.

Explosive components developed at NWC include items as diverse as destructors that can interrupt missile flight in either a self-destruct or command-destruct mode, low-level explosive elements such as detonators that are used to ignite warhead initiation systems, and gas generators that produce the gas pressure needed to activate mechanical devices before a fuze can be armed.



NWC-developed fuze systems have an outstanding safety record; our fuze systems are so safe and reliable that no in-service maintenance or prelaunch checkouts are needed.

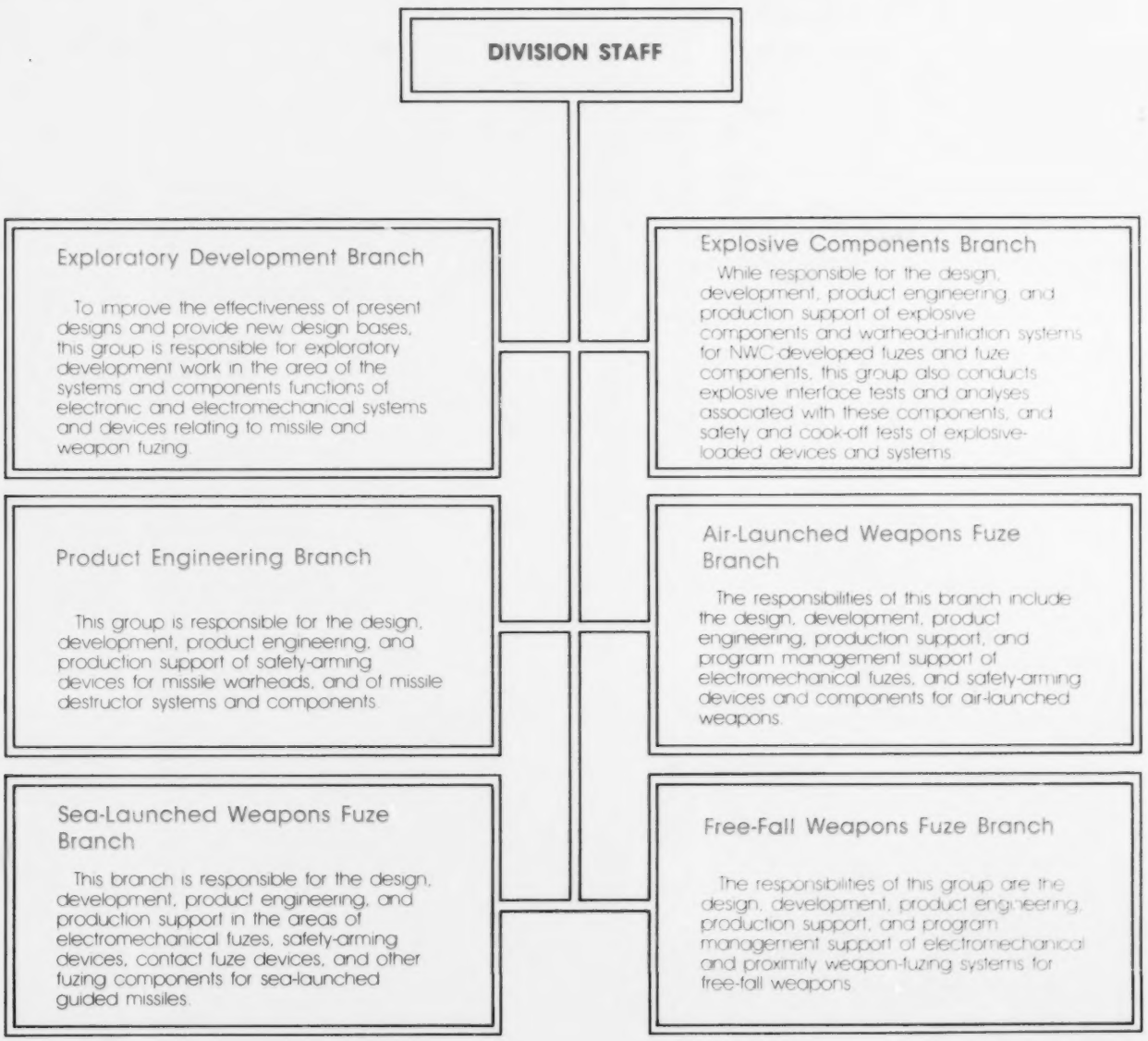


PERSONNEL

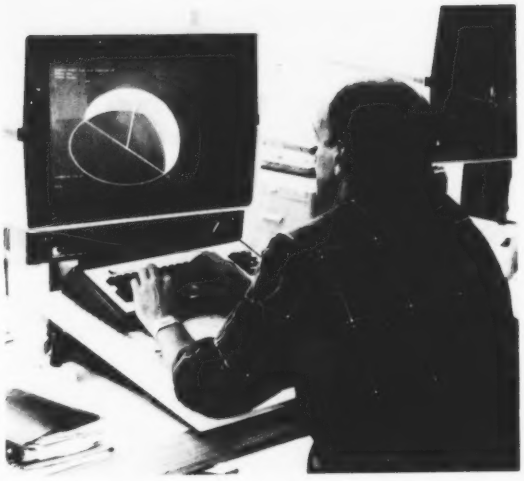
Good fuzes are developed by good people and good engineering.

The design, product engineering, test and evaluation, and documentation of mechanical, electronic, and explosive components require personnel with a wide range of skills and capabilities.

Over half of the people who work in the Electromechanical Division are mechanical, electronics, chemical, or industrial engineers. Technicians and specialists make up about one-third of the staff. Approximately one-fifth of the Division's professionals have advanced degrees.


DIVISION STAFF
Exploratory Development Branch
To improve the effectiveness of present designs and provide new design bases, this group is responsible for exploratory development work in the area of the systems and components functions of electronic and electromechanical systems and devices relating to missile and weapon fuzing.
Explosive Components Branch
While responsible for the design, development, product engineering, and production support of explosive components and warhead-initiation systems for NWC-developed fuzes and fuze components, this group also conducts explosive interface tests and analyses associated with these components, and safety and cook-off tests of explosive-loaded devices and systems.
Product Engineering Branch
This group is responsible for the design, development, product engineering, and production support of safety-arming devices for missile warheads, and of missile destructor systems and components.
Air-Launched Weapons Fuze Branch
The responsibilities of this branch include the design, development, product engineering, production support, and program management support of electromechanical fuzes, and safety-arming devices and components for air-launched weapons.
Sea-Launched Weapons Fuze Branch
This branch is responsible for the design, development, product engineering, and production support in the areas of electromechanical fuzes, safety-arming devices, contact fuze devices, and other fuzing components for sea-launched guided missiles.
Free-Fall Weapons Fuze Branch
The responsibilities of this group are the design, development, product engineering, production support, and program management support of electromechanical and proximity weapon-fuzing systems for free-fall weapons.

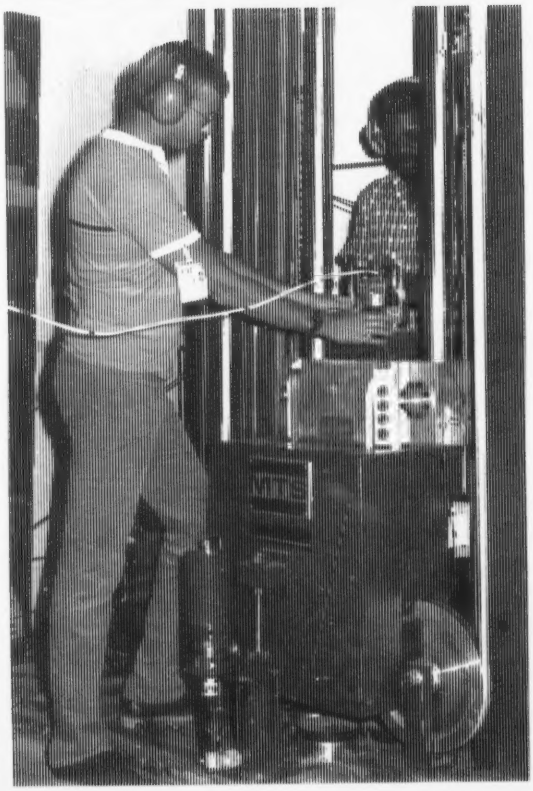
FACILITIES

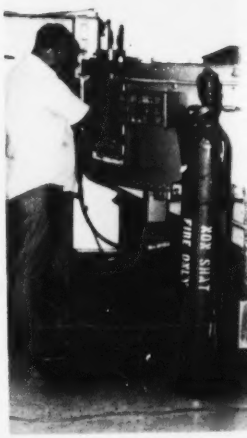


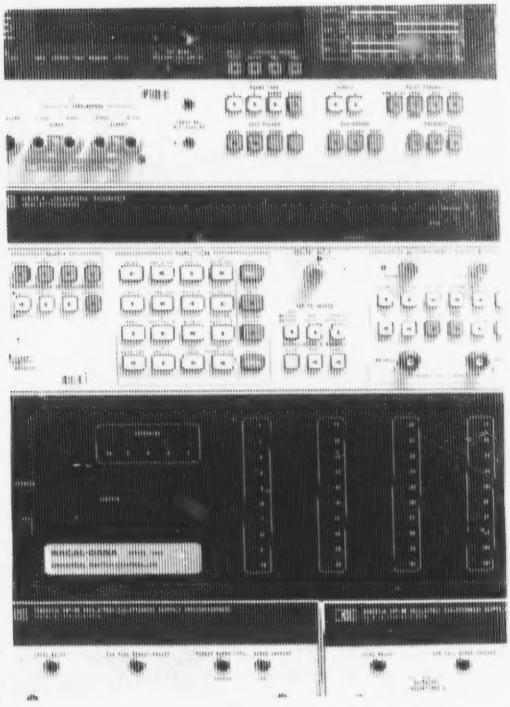
At NWC, good fuzes are designed and developed in modern, well-equipped facilities.

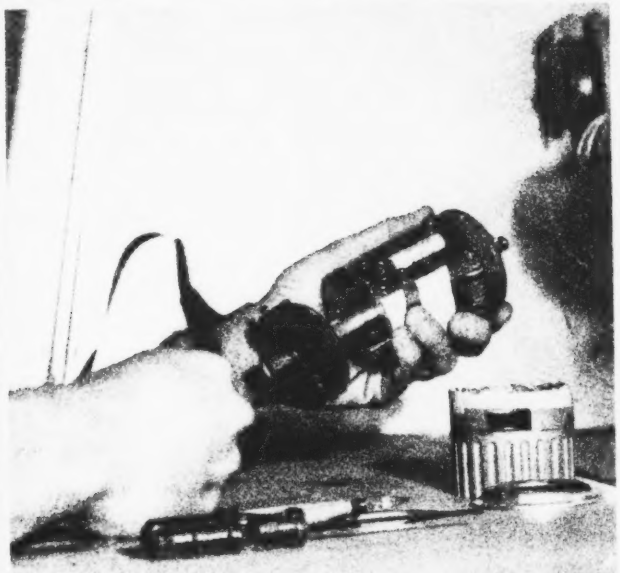
General engineering laboratory equipment and work areas are available to all technical personnel. Computing facilities, including an interactive-graphics facility, provide computer-aided engineering and design capabilities for both design and documentation work.

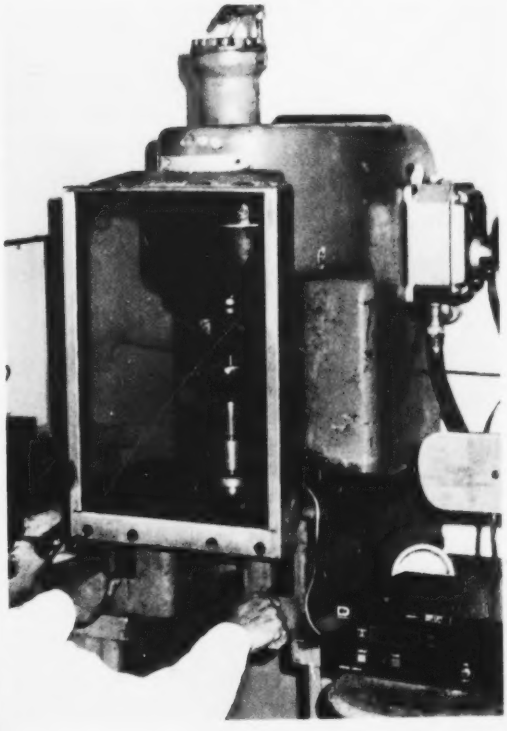
The Electromechanical Division's operability laboratory houses state-of-the-art equipment that can simulate shock, temperature, and flight environments. The Division's engineers use the specially designed explosive test facility to safely test high-energy explosive components.

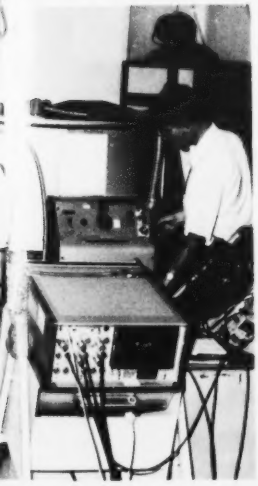












PHILOSOPHY, PERFORMANCE, AND GOALS

PHILOSOPHY

We are responsible for our products from inception to phaseout. This philosophy keeps our engineering personnel in the picture all the way from design inception of an item, through its development, production, and Fleet use, and until its retirement from Fleet inventory or replacement by an improved item.

Our design-test-analyze-and-fix philosophy ensures safe, rugged, and reliable component designs. At the same time that we develop a component, we carefully document how the component was produced and tested. The final product is the result of improvements made during the research, development, test, and evaluation (RDT&E) process.

PERFORMANCE

Our philosophy has resulted in an impressive product reliability and safety record.

In actual tests, NWC-developed safety-arming devices have demonstrated over 99% reliability. On over 100,000 missile flights, our safety-arming devices correctly armed warheads at the right time and the right place.

Over 500,000 NWC-designed units have been manufactured and are in the Fleet inventory. Weapons containing these units have been successfully fired in actual combat. NWC-designed units have never experienced a safety failure.

Good designs + successful T&E = confidence in performance.

GOALS

We maintain our excellent safety record because we design and build safety and reliability into our products. Simplicity, mass producibility, commonality of parts, and zero maintenance provide inherent reliability.

We develop and use state-of-the-art design concepts to keep the Fleet battle-ready. Our use of modern manufacturing techniques and processes keeps our products at the peak of technological excellence.

Our goal is to provide the Fleet with the world's safest, most reliable, and most effective fuze systems and components.

CURRENT PROGRAMS

EXPLORATORY AND ADVANCED DEVELOPMENT

Our exploratory and advanced development work applies the latest technical innovations to current programs involving electromechanical fuzes, safety-arming devices, contact fuze devices, explosive components, and arming-firing devices.

Specific programs for the development of electromechanical fuzes include the

- adaptive penetration fuze
- Tomahawk variable time-delay fuze
- advanced surface attack weapon fuze
- Walleye III fuze

Programs involving safety-arming devices include the

- ACIMD safety-arming device/warhead-initiation system
- Standard missile directional warhead safety-arming device
- advanced electronic safety-arming device

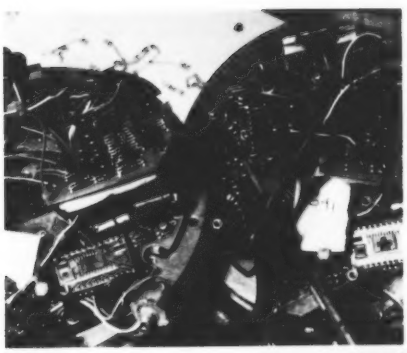
Programs for the development of contact fuze devices include the

- fiber optic contact fuze
- integrated circuit contact fuze
- acoustic emission contact fuze
- chip accelerometer contact fuze

Work in the area of explosive components involves the

- film-bridge detonator
- advanced explosive train evaluations
- EAK loaded Mk 80 bomb booster

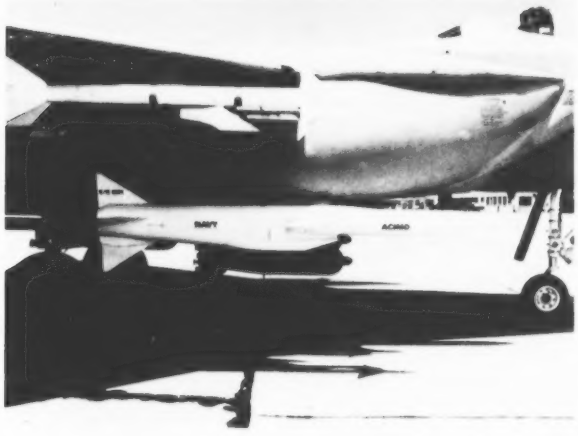
Exploratory development work on arming-firing devices involves ACIMD, a program for which NWC has lead laboratory responsibility.



ENGINEERING DEVELOPMENT/PRODUCT IMPROVEMENT

Our current engineering-development/product-improvement efforts involve

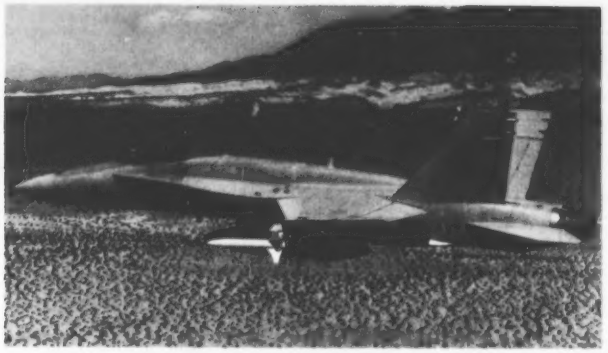
- safety-arming devices for the Tomahawk submunition fuze and the AMRAAM fuze
- arming-firing devices for AMRAAM, RAM (Mk 298 Mod 0/1), Tomahawk, and Sparrow/Seasparrow AIM/RIM-7M PIP (Mk 290 Mod 0)
- guided missile destructor for the Standard Missile-(N) (Mk 58)
- contact fuzes for Sparrow (Mk 17 fuze triggering device), Phoenix (Mk 13 Mod 0 fuze triggering device), Standard Missile-(N) (Mk 4 Mod 0 contact fuze device), and RAM (Mk 22 Mod 0 contact fuze triggering device)
- bomb/dispenser fuzes for the Mk 80 series bombs (FMU-139/B electronic bomb fuze) and for Rockeye, Bigeye, and APAM (FMU-140/B dispenser proximity fuze)

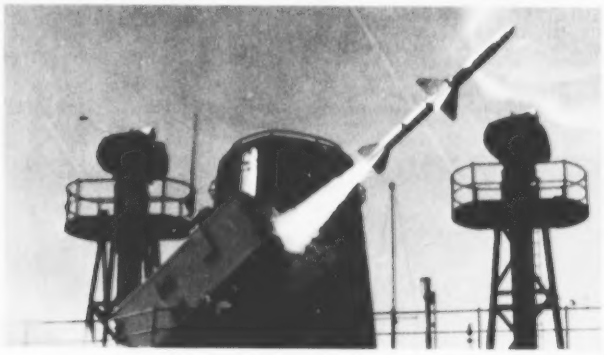


PRODUCTION AND FLEET ENGINEERING SUPPORT

We provide production and engineering support to the Fleet on a number of critical programs, including programs concerned with the following components:

- safety-arming devices and fuzes for Harpoon (FMU-109/B), Maverick (FMU-135/B), Tomahawk (FMU-138/B), Walleye (FMU-94/B), Phoenix (FSU-10/A), Sidewinder (Mk 3 Mod 5 and Mk 13 Mod 2), Standard Missile (Mk 17 Mod 0, Mk 51 Mod 0, and Mk 76 Mod 0), and Sparrow (Mk 33 Mod 0)
- arming-firing devices for Harpoon (FSU-12/B), Seasparrow (Mk 290 Mod 0), and Standard Missile
- guided missile destructors for HARM (Mk 29) and Standard Missile (Mk 1 Mod 1 arming-firing device and Mk 2 Mod 0 destructor charge)
- contact fuzes for the Standard, Sparrow (Mk 17 Mod 0), and Phoenix (Mk 13 Mod 0) missiles
- bomb/dispenser fuzes for the Mk 80 series bombs (FMU-139/B electronic bomb fuze) and for Rockeye, Bigeye, and APAM (FMU-140/B dispenser proximity fuze)
- explosive components including detonators (MK 71 Mod 1), boosters (Mk 44, Mk 60, Mk 38), leads (Mk 8, Mk 9, Mk 14, Mk 16, Mk 28, Mk 29), and delay detonators (Mk 85, Mk 86)



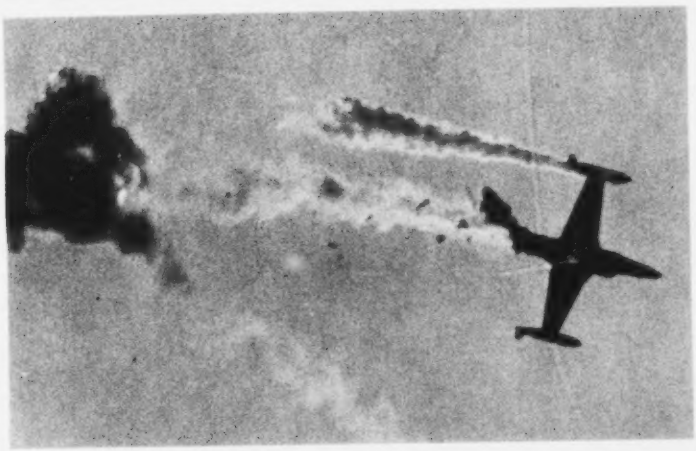


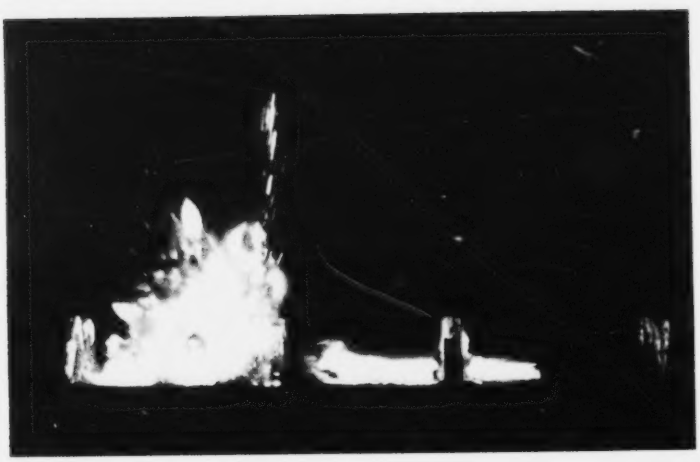
THE NAVAL WEAPONS CENTER

NWC is located about 150 miles north of Los Angeles in Southern California's Mojave Desert. The Center's land holdings include over a million acres of the vast sparsely populated desert. Near-perfect flying weather year-round and practically unlimited visibility make NWC an ideal location not only for test and evaluation activities, but for research and development tasks as well.

NWC's workload includes over 1,500 separate programs and tasks, which are carried out by a skilled team of civilian scientists and military personnel. Major R&D programs include Sidewinder, Sparrow, and the Advanced Common Intercept Missile Demonstration (ACIMD) air-to-air missiles; hypervelocity projectiles for the Standard surface-to-air and Phoenix air-to-air missiles; Harpoon, Skipper, Seafar, Bigeye, and Walleye air-to-surface weapons; Tomahawk air- and surface-to-surface cruise missile; Rolling Airframe Missile (RAM) point defense system; SideARM and HARM antiradiation missiles; parachutes; telemetry systems; avionics hardware and software for a variety of fighter and attack aircraft; tactical electronic-warfare and countermeasure systems; simulation of threat weapon systems; broad technology-base efforts; and test and evaluation of a wide range of antiair and antisurface systems.

NWC's mission is to be the principal Navy research, development, test and evaluation center for air warfare systems (except antisubmarine warfare systems) and missile weapons systems and the national range/facility for parachute test and evaluation.





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